REMARKS

Claims 1 – 54, 66 – 79, 90 – 105, 107 – 110, 112, 114 – 117, 119 and 121 are presently under consideration, the remaining claims having been withdrawn.

REJECTION UNDER 35 U.S.C. § 102

The Examiner rejected claims 1 – 3, 24, 25 and 66 under 35 U.S.C. § 102(b) as being anticipated by Iwata et al. (U.S. Pat. No. 4,117,390. The Examiner also rejected claim 34 under 35 U.S.C. § 102(b) as being anticipated by Walker [sic, Walter] (U.S. Pat. No. 6,665,158). Applicants respectfully traverse these rejections.

Iwata et al. is directed to a double-voltage, automotive type alternator. To provide an AC output at a voltage substantially higher than the normal automotive voltage of 12 – 24 V, such as a voltage in the 80 – 90 V range, a three-phase alternator is star connected and has two armature windings. The armature windings may be serially connected or may be separately wound, on the same stator, one winding being of comparatively few turns of heavy wire and connected to a rectifier to provide normal DC on-board voltage for the vehicle, which voltage is controller by a voltage regulator connected to the DC output terminals. The other winding, which may have a much larger number of turns of finer wire, provides the high voltage output at terminals adapted for connection to heater wires in the windshield. [Iwata et al., Abstract].

More specifically, Iwata et al's alternator is a three-phase generator 1 having a stator winding 2 secured to armature [sic, stator] core laminations 2a. The armature [sic, stator] is star-connected and has a center or star point 2' and three stator windings, each of which is formed by a first, main winding portion 3 and a second winding portion

4. The three phases of the first and second winding portions are connected in series at a common junction 5 so that the respective phases of the two armature [sic, stator] windings are serially connected, the phases themselves being star connected and the winding portions 3, 4 joined at the junctions 5. [Iwata et al., col. 2, lines 17 – 28]. The terminal ends of the second armature [sic, stator] portions 4 are brought out to end terminals 16 to provide high voltage terminals from the alternator. Terminals 16 are connected over switch 15 to heater elements 17, for example to heat the windshield, the rear window, or other glass panes by connecting heater elements 17 through switch 15. [Iwata et al., col. 2, lines 46 – 53]

Turning first to independent claim 1, it is directed to a generator system having at least first and second modes. The generator system produces a first alternating current output voltage when in the first mode and produces both the first alternating current output voltage and a second alternating current output voltage when in the second mode with the second output voltage being twice the first output voltage. Claim requires, *inter alia*, "first and second voltage sources each having an output at which they produce the first output voltage, and a switch coupling the first and second outputs of the first and second voltage sources in parallel when the switch is in a first position and in series when the switch is in a second position, the first output voltage produced at the outputs of the first and second voltage sources when the switch is in the first position and the second output voltage produced across the series coupled outputs of the first and second voltage sources when the switch is in the second position with the first output voltage also produced at the outputs of the first and second voltage sources when the switch is in the second position." The Examiner cites Iwata et al's double-

voltage alternator as having at least first and second modes where it produces a first alternating current output voltage when in the first mode and produces the first alternating current output voltage and a second alternating current output when in the second mode. Applicants submit that Iwata et al's alternator does not have two modes. Rather, it has one mode in which is produces two voltages. The first voltage is produced across main winding portions 3 (which the Examiner cites as a first voltage source) of stator windings 2 and the second voltage is produced across second winding portions 4 (which the Examiner cites as a second voltage source) of stator windings 2. [*See,* Iwata et al. col. 2, lines 29 – 53; col. 2, line 61 – col. 3, line 6] Further, the voltage produced across second winding portions 4 is not twice the voltage produced across main winding portions 3, it is about eight times the voltage. [Iwata et al. col. 3, lines 3 – 6]

Further, Iwata et al.'s switch 15 connects the second winding portions 4 to heater wire elements 17 when closed and disconnects second winding portions from heater elements 17 when open. [Iwata et al., col. 2, lines 46 – 53] It does not switch the main winding portions 3 and second winding portions 4 between series and parallel connections. As such, Iwata et al's switch 15 does not meet the limitation of claim 1 that requires "a switch coupling the first and second outputs of the first and second voltage sources in parallel when the switch is in a first position and in series when the switch is in a second position, the first output voltage produced at the outputs of the first and second voltage sources when the switch is in the first position and the second output voltage produced across the series coupled outputs of the first and second voltage sources when the switch is in the second position with the first output voltage

also produced at the outputs of the first and second voltage sources when the switch is in the second position." Applicants submit that claim 1 is thus allowable over Iwata et al.

Turning to independent claim 66, it is directed to a method of controlling a generator system having at least first and second modes. The generator system produces a first alternating current when it is in the first mode and produces both the first output voltage and a second alternating current output voltage when it is in the second mode with the second output voltage being twice the first output voltage. Claim 66 requires, *inter alia*, coupling the outputs of the first and second voltage sources in parallel and operating the first and second voltage sources are in phase when the generator system is in the first mode, and coupling the outputs of the first and second voltage source in series and operating the first and second voltages so that the voltages at the outputs of the first and second voltage sources are one-hundred and eighty degrees out of phase when the generator system is in the second mode with the second output voltage produced across the series coupled outputs of the first and second voltage sources and the first output voltage produced at each of the outputs of the first and second voltage sources. As discussed above with respect to claim 1, Iwata et al's alternator does not have first and second modes. It has one mode where two different voltages are always produced, one across main winding portions 3 and the other across second winding portions 4. Further as discussed above with respect to claim 1, Iwata et al's main winding portions 3 and second winding portions 4 are not switched between series and parallel connections. Switch 15 just connects and disconnects second winding portions 4 to heater elements 17. As such, Iwata et al's alternator is not

operated so that in one mode, the output voltages of main winding portions 3 and second winding portions 4 are in-phase and in the other mode, are one-hundred and eighty degrees out of phase. Applicants submit that independent claim 66 is thus allowable over Iwata et al.

Claims 2, 3, 24 and 25 depend directly or indirectly from independent claim 1 and are allowable for at least that reason.

With regard to claim 34, applicants note that it is a dependent claim that depends from independent claim 1. Since the Examiner did not reject claim 1 as being anticipated by Walter, applicants are unsure as to the basis of rejecting claim 34 as being anticipated by Walter. In any event, applicants submit that Walter does not anticipate claim 1, and thus does not anticipate claim 34. More specifically, Walter does not disclose a switch that "a switch coupling the first and second outputs of the first and second voltage sources in parallel when the switch is in a first position and in series when the switch is in a second position, the first output voltage produced at the outputs of the first and second voltage sources when the switch is in the first position and the second output voltage produced across the series coupled outputs of the first and second voltage sources when the switch is in the second position with the first output voltage also produced at the outputs of the first and second voltage sources when the switch is in the second position" as required by claim 1. Walter's relay 70 does not switch outlets 64, 66 (which the Examiner cites as a first voltage source) and outlet 68 (which the Examiner cites as a second voltage source) between series and parallel. Rather, relay 70 is used simply to short outlet 68 when it is closed. [Walter, col. 4, lines 39 – 43]. Applicants submit that claim 1, and claim 34 that depends from claim 1, are

allowable over Walter. Applicants also note that Walter was first published August 21, 2003. As the present application claims the benefit of a provisional application filed January 17, 2003, Walter, if it is prior art at all, is prior art only under § 102(e).

REJECTIONS UNDER 35 U.S.C. § 103

The Examiner rejected claims 4 – 6 under 35 U.S.C. § 103(a) as being unpatentable over Iwata et al. in view of Mashino et al. (U.S. Pat. No. 5,097,165). Claims 4 – 6 depend directly or indirectly from independent claim 1 and are allowable for at least this reason.

The Examiner rejected claims 7 – 9 under 35 U.S.C. § 103(a) as being unpatentable over Iwata et al. in view of Mashino et al. as applied to claims 4 – 6 and further in view of Koyama (U.S. Pat. No. 5,159,539). Claims 7 – 9 depend directly or indirectly from independent claim 1 and are allowable for at least this reason.

With regard to claim 8, none of Iwata et al., Mashino et al. or Koyama disclose or suggest the use of cycloconverters to provide the AC power of the first and second voltage sources where the cycloconverters are operated in-phase when the switch is in its first position coupling the outputs of the first and second voltage sources in parallel and the cycloconverters are operated one-hundred and eighty degrees out of phase when the switch is in the second position coupling the outputs of the first and second voltage sources in series. In this regard, only Koyama discloses a cycloconverter, and based on Figures 7 and 11, does not appear to contemplate the use of more than one cycloconverter. For this reason also, applicants submit that claim 8 is allowable over Iwata et al, in view of Mashino et al. in view of Koyama.

The Examiner rejected claims 10 – 18, 26 – 33, 35 – 54, 67 – 79, 90 – 105, 107 – 110, 112, 114 – 117, 119 and 121 under 35 U.S.C. § 103(a) as being unpatentable over Iwata et al. in view of Mashino et al. further in view of Koyama and further in view of Latos et al. (U.S. Pat. No. 5,512,811). Applicants respectfully traverse these rejections.

Claims 10 – 18 and 26 – 33 depend directly or indirectly from independent claim 1 and are allowable for at least that reason.

Claims 67 – 79 depend directly or indirectly from independent claim 66, and are allowable for at least that reason.

Further claims 14, 68 and 70 all require that each cycloconverter includes a positive and negative bank of naturally commutated switching devices. Koyoma's cycloconverter contemplates the use of transistors such as MOSFETS, which are not naturally commutated switching devices.

Claims 35, 50, 54, 90, 99 are the independent claims of this group of claims rejected under 35 U.S.C. § 103(a). Turning first to independent claim 35, it is directed to a generator system having an output coupled to a cycloconverter where the cycloconverter has a positive bank of naturally commutated switching devices and a negative bank of naturally commutated switching devices. It further requires a rotor position sensor for sensing the position of a rotor of the generator and generating a signal indicative of the position of the rotor. It also requires a controller that uses the rotor position signal to develop control waves which it uses to control switching of the naturally commutated switching devices of the positive and negative banks.

Of the references cited by the Examiner in rejecting claim 35, only Koyoma disclose a cycloconverter. And Koyoma's cycloconverter is not used in an AC generator

having a rotor. Rather, as can be seen from Fig. 1, a DC voltage source 12 feeds an inverter circuit 14 which feeds a transformer 2A, which feeds cycloconverter 15 which feeds filter circuit 4 to which a load 13 is connected. Since Koyoma's device does not include a rotor, and Koyoma is the only reference applied in rejecting claim 35 that discloses a cycloconverter, applicants submit that none of these references disclose or suggest a controller that uses a rotor position signal to develop control waves which it uses to control switching of the naturally commutated switching devices of the positive and negative banks of the cycloconverter as required by claim 35. Also, Koyoma contemplates the use of transistors such as MOSFETs, which are not naturally commutated switching devices. Applicants submit that claim 35 is thus allowable over Iwata et al. in view of Mashino et al. in view of Koyama in view of Latos et al.

Claims 36 – 49 depend directly or indirectly from independent claim 35, and are allowable for at least that reason.

Further, claim 44 requires that the controller determine that the true zero current condition at the output of one of the cycloconverters occurs by sensing that the positive and negative banks are non-conducting. Applicants submit that Koyoma does not discuss how zero current is determined and in this regard, Koyoma just discusses measuring current. As such, applicants submit that Koyoma does not disclose or discuss determining that a true zero current condition at one of the cycloconverter occurs by sensing that the positive and negative banks are non-conducting. And the Examiner does not cite any specific section of Koyoma as doing so. Applicants submit that claim 44 is allowable for this reason also.

Claim 46 requires a band pass filter for filtering the instantaneous output current of each cycloconverter to reduce current ripple and ensure that a signal output by the bandpass filter at a fundamental frequency does not have any phase-shift relative to the instantaneous output current. It further requires that the signal output by the bandpass filter is coupled to an input of a comparator that generators a signal indicative of whether the instantaneous current output has transitioned from positive to negative or from negative to positive. Applicants submit that Koyoma does not address how current information is obtained and processed to determine that the instantaneous current output has transitioned between positive and negative, and in particular does not disclose or suggest a bandpass filter as required by claim 46. And the Examiner does not cite any specific section of Koyoma as doing so. Applicants submit that claim 46 is allowable for this reason also.

Independent claim 50 similarly includes limitations similar to those recited in claim 46 discussed in the preceding paragraph. Applicants submit that claim 50 is thus allowable for at least the reasons discussed in the preceding paragraph.

Claims 51 – 53 depend directly or indirectly from claim 50 and are allowable for at least that reason.

Also, claim 51 requires that the controller sense that the true zero current condition at the output of the cycloconverter occurs when a voltage across each of the naturally commutated switching devices is above a predetermined level indicating that each of the naturally commutated switching devices is non-conducting. For much the same reasons discussed above with respect to claim 44, applicants

cites limitations similar to those recited in claims

Turning to independent claim 54, it is directed to a generator system. It requires, *inter alia*, a cycloconverter having a positive bank of naturally commutated switching devices and a negative bank of naturally commutated switching devices. It further requires that each naturally commutated switching device includes a silicon controlled rectifier/opto-silicon controlled rectifier combination. Of the references applied in rejecting independent claim 54, Koyoma is the only one that discloses a cycloconverter. And Koyoma does not disclose silicon controller rectifier/opto-rectifier combinations used as the switching devices of its cycloconverter 15. As described in Koyoma, "The cyclo-converter circuit 15 comprises . . . semiconductor switching devices S5 to S8 and S5A to S8A such as transistors and MOSFETs, diodes D5 to D8 and D5A to D8A connected to the above-described switching devices S5 to S8 and S5A to S8A in an inverted parallel manner . . . ." [Koyoma, col. 5, lines 36 – 43] Further, MOSFETs are not naturally commutated switching devices. Applicants submit that claim 54 is thus allowable over the combination of Iwata et al., Mashino et al., Koyama and Latos et al.

Claim 67, which depends from claim 66, requires, *inter alia*, generating rotor position signals indicative of a position of a rotor of a permanent magnet generator and developing control waves from the rotor position signals. It further requires using these control waves to control first and second cycloconverters. Koyoma is the only reference applied in rejecting claim 67 that discloses a cycloconverter. As discussed above with respect to claim 35, Koyoma's cycloconverter is not used in an AC generator having a rotor. As such, for reasons similar to those discussed above with respect to claim 35, applicants submit that claim 67 is allowable over Iwata et al. in view of Mashino et al. in view of Koyama in view of Latos et al.

Independent claim 90 is directed to a method of controlling a generator system having an AC generator with an output coupled to a cycloconverter. It requires, *inter alia*, developing control waves based upon the position of a rotor of the AC generator and using the control waves to control switching of naturally commutated switching devices of the cycloconverter. For reasons similar to those discussed with respect to claims 35 and 67, applicants submit that claim 90 is allowable over the combination of Iwata et al. in view of Mashino et al. in view of Koyama in view of Latos et al.

Claims 90 – 98 depend directly or indirectly from claim 90 and are allowable for at least that reason.

Further, claim 91 requires using rotor position signals to generate the control waves. As discussed with respect to claim 35, Koyoma, the only reference disclosing a cycloconverter, does not include a rotor. Applicants submit that claim 91 is allowable for this reason also.

Claim 95 requires determining that the true current condition occurs when all of the naturally commutated switching devices are non-conducting. For much the same reasons discussed above with respect to claim 44, applicants submit that claim 45 is allowable.

Claim 97 requires bandpass filtering the instantaneous output current of the cycloconverter to produce a filtered signal to reduce current ripple and ensure that a fundamental frequency component of the filtered signal does not have any phase-shift relative to the instantaneous output current. It also requires comparing the filtered signal to at least one reference level to determine whether the instantaneous output current transitioned from positive to negative or from negative to positive. For much the

same reasons discussed above with respect to claim 46, applicants submit that claim 97 is allowable.

Independent claim 99 is directed to a method of controlling a generator system having an AC generator with an output coupled to a cycloconverter that has positive and negative banks of naturally commutated switching devices. It requires, *inter alia*, enabling one of the positive and negative banks and disabling the other of the positive and negative banks based on the instantaneous output current of the cycloconverter produced at an output of the cycloconverter transitioning between positive and negative or between negative and positive, and bandpass filtering the instantaneous output current of the cycloconverter to produce a filtered signal to reduce current ripple and ensure that a fundamental frequency component of the filtered signal does not have any phase-shift relative to the instantaneous output current, and comparing the filtered signal to at least one reference level to determine whether the instantaneous output current transitioned from positive to negative or from negative to positive. For much the same reasons discussed above with respect to claims 44 and 46, applicants submit that claim 99 is allowable. Also, as discussed above, Koyoma's MOSFETs are not naturally commutated switching devices.

Claims 100 – 105 depend directly or indirectly from claim 99 and are allowable for at least that reason.

Also, claim 101 requires determining that the true current condition occurs when all of the naturally commutated switching devices are non-conducting. For much the same reasons discussed above with respect to claim 44, applicants submit that claim 101 is allowable.

Claims 107 and 108 depend indirectly from independent claim 1 and are allowable for at least that reason. Further, claims 107 and 108 require that the controller simulates back emf voltage waveforms of the generator using the rotor position signal and develops control waves from the back emf voltage waveforms which it uses to control the cycloconverters. Koyoma is the only reference applied in rejecting claim 107 that discloses a cycloconverter. As discussed above with respect to claim 35, Koyoma's cycloconverter is not used in an AC generator having a rotor. As such, applicants submit that none of the references applied in rejecting claims 107 and 108 disclose or suggest a controller that simulates back emf voltage waveforms of the generator using the rotor position signal and develops control waves from the back emf voltage waveforms which it uses to control the cycloconverters as required by claims 107 and 108. Applicants submit that claims 107 and 108 are thus allowable over the combination of Iwata et al. in view of Mashino et al. in view of Koyama in view of Latos et al.

Claims 109 and 110 depend directly or indirectly from claim 35 and are allowable for at least that reason. Further, claims 108 and 110 contain limitations comparable to those discussed above with respect to claims 107 and 108, and are allowable for similar reasons.

Claim 112 depends indirectly from claim 66 and is allowable for at least that reason. Claim 67 also includes limitations, in the context of a method as opposed to a system, similar to those discussed above with respect to claims 107 and 108 and is allowable for similar reasons.

Claim 114 depends from independent claim 90, and is allowable for at least that reason. Claim 114 also includes limitations, in the context of a method as opposed to a system, similar to those discussed above with respect to claims 107 and 108 and is allowable for similar reasons.

CONCLUSION

It is believed that all of the stated grounds of rejection have been properly traversed, accommodated, or rendered moot. Applicant therefore respectfully requests that the Examiner reconsider and withdraw all presently outstanding rejections. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. Thus, prompt and favorable consideration of this amendment is respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at (248) 641-1600.

Respectfully submitted,

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